LUMISCAN LSDT CONFIGURATION GUIDE

LUMISYS

LUMISYS

LUMISCAN LSDT
FILM DIGITIZER / CR READER
CONFIGURATION GUIDE

P/N 0071-434 Rev 01
February 26, 1999

FORWARD

Proprietary Notice and Disclaimer
The information herein disclosed is the property of **Lumisys**. Information in this document is subject to change without notice and does not represent a commitment on the part of **Lumisys** to incorporate changes or improvements in units previously sold or shipped. No part of this document may be reproduced or transmitted in any form, electronic or mechanical, including photocopying and recording, for any purpose other than the purchaser's own use without the express written permission of **Lumisys**.

Copyright 1996, 1998 All rights reserved.

Trademarks
Lumisys, LSDT, LUMISCAN, LUMISCAN 20, LUMISCAN 50, LUMISCAN 75, LUMISCAN 85 and **ACR-2000** are the trademarks of **Lumisys**. All other trademarks are the property of their respective owners, and are hereby acknowledged.

For more information contact:

Lumisys, Inc.
225 Humboldt Court
Sunnyvale, CA 94089
(408) 733-6565
(408) 733-6567 FAX

TABLE OF CONTENTS

1 PURPOSE 3

2 SCOPE 3

3 REFERENCE DOCUMENTS 3

4 TERMINOLOGY 4

5 PERSONNEL TRAINING REQUIREMENTS 4

6 HOST SUPPORT PACKAGE COMPATIBILITY 5

6.1 LSDT DIGITIZER INTERFACE TYPES 6
6.2 LSDT HOST SUPPORT PACKAGES 6
6.3 HOST COMPUTER REQUIREMENTS 6

7 LUMISYS LSDT INTERFACES 7

7.1 DCB INTERFACE 7
7.1.1 DCB switches 7
7.1.2 Correction LUT File 7
7.1.3 Calibration LUT File (ACR-2000 Only) 8
7.2 SCSI INTERFACE 8
7.2.1 Correction LUT File 8
7.2.2 SCSI ID Configuration 8

8 LUMISYS HOST SUPPORT PACKAGES 10

8.1 LSDT-16 FOR DOS, WINDOWS 3.X, WINDOWS 95, AND WINDOWS 98 10
8.1.1 Installation 10
8.1.2 Configuration 10
8.2 LSDT-32 FOR WINDOWS 95, WINDOWS 98 AND WINDOWS NT 11
8.2.1 Installation 11
8.2.2 DCB Interface on Windows NT 11
8.2.3 LSDT Registry Parameters 11
8.3 TWAIN-32 12
8.4 SCSI-98 12

9 LSDT DCB JUMPER AND SWITCH SETTINGS 13

9.1 ALTERING THE DCB SETTINGS 13
9.1.1 Identifying your Data Control Board (DCB) 13
9.1.2 Changing IRQ Level 13
9.1.3 Changing Memory Address 13
9.1.4 Changing Base I/O Address 14
9.1.5 Changing Memory Size 15

APPENDIX A: LUMISYS IMAGE HEADER FORMAT 16

1 PURPOSE

This document tells you how to install and configure the Host Support Package (HSP) software and hardware interfaces for all **LUMISCAN LSDT** film digitizers and CR readers.

2 SCOPE

The **LUMISCAN LSDT** digitizers and readers are precision instruments designed to digitize films and phosphor CR plates and measure x-ray exposure over a wide dynamic range with a high signal-to-noise ratio.

LSDT MODELS	
LUMISCAN 20	CCD Film Digitizer
LUMISCAN 50	Laser Film Digitizer
LUMISCAN 75	Laser Film Digitizer
LUMISCAN 85	Laser Film Digitizer
LUMISCAN 85-LF	Laser Film Digitizer
LUMISCAN 85-SDR	Laser Film Digitizer
ACR-2000	Laser CR Reader

3 REFERENCE DOCUMENTS

LSDT API Dynamic Link Library Reference Guide	P/N 0068-105
LSDT Software Library Reference Guide	P/N 0066-022
LUMISCAN 20 Operator's Reference Guide	P/N 0069-384
LUMISCAN 50 / 75 / 85 Operator's Reference Guide	P/N 0061-494
ACR-2000 Reader And Eraser Operator's Reference Guide	P/N 0070-711
LUMISCAN LSDT SCSI Compatibility Protocol Specification	P/N 0067-890
LSDT Internal SCSI Option Operator's Supplement Manual	P/N 0070-275

4 TERMINOLOGY

NOTE In this document, when we use the term “film”, we mean a somewhat generic reference to “whatever is being scanned”. Currently, several types of media are used in various Lumisys film digitizers and CR readers:

• Film (photographic negatives)	LS20	CCD Digitizer
	LS50, LS75, LS85	Laser Digitizers
• Phosphor-coated CR plates	ACR-2000	CR Reader
• Fluorescent CR test patterns	ACR-2000	CR Reader

NOTE In this document, we use the term “digitizer” to mean a somewhat generic reference to either a (film) digitizer or (CR) reader.

5 PERSONNEL TRAINING REQUIREMENTS

You will need a basic working knowledge of the Operating System on the computer onto which you are installing the HSP.
You will need to be able to configure hardware switches and jumpers.
For the PC ISA-based Data Control Board (DCB) interface, you will need to be able to install a PC ISA card.

HOST SUPPORT PACKAGE COMPATIBILITY

Lumisys supports various combinations of:

- **LSDT** Digitizer Interface Types — DCB, SCSI
- **LSDT** Host Support Packages — LSDT-16, LSDT-32, SCSI-98
- Operating Systems — DOS, Windows 3.x, Windows 95, Windows 98, Windows NT, others
- Application Types — 16- or 32-bit

DCB		Host Support Package			
		LSDT-16	LSDT-32	TWAIN-32	SCSI-98
Operating System	DOS	FL-16			
	Win 3.x	FL-16, DLL-16			
	Win 95	FL-16, DLL-16			
	Win 98	FL-16, DLL-16			
	Win NT		DLL-32	TW-32	
	Other OS				

SCSI		Host Support Package			
		LSDT-16	LSDT-32	TWAIN-32	SCSI-98
Operating System	DOS				SP
	Win 3.x				SP
	Win 95		DLL-32	TW-32	SP
	Win 98		DLL-32	TW-32	SP
	Win NT		DLL-32	TW-32	SP
	Other OS				SP

HSP	Support Types
LSDT-16	API (Function Library and DLL, both 16-bit)
LSDT-32	API (16-bit DLL)
TWAIN-32	API (16-bit DLL)
SCSI-98	Lumisys SCSI-98 Protocol and Test Progam Source

Sup. Type	Description
FL-16	API *F*unction *L*ibrary (16-bit)
DLL-16	API *D*ynamic *L*ink *L*ibrary (16-bit)
DLL-32	API *D*ynamic *L*ink *L*ibrary (32-bit)
TW-32	TWAIN DLL (32-bit)
SP	Lumisys *S*CSI-98 *P*rotocol and Test Program Only

LSDT Digitizer Interface Types

A **LUMISCAN LSDT** digitizer comes configured with one of two interface types:

- ISA-based Data Control Board (for PCs)
- Internal SCSI Option (for PCs and workstations)

LSDT Host Support Packages

Lumisys provides host support software in several forms:

- LSDT-16 Run-time and development support for 16-bit applications
- LSDT-32 Run-time and development support for 32-bit applications
- TWAIN-32 Industry-standard run-time support for 32-bit applications
- SCSI-98 Development support for all applications using **LSDT** digitizers with the Internal SCSI Option (ISO).

Lumisys provides two types of host support software. These are:

- Development needed to develop applications that use an **LSDT** digitizer.
- Run-time required by the end user to test and operate an **LSDT** digitizer, or

HSP	Run-Time Support	Development Support
LSDT-16	DOS Driver, DLL, Extensive Tools	.LIB, .H, Sample source, API Manual
LSDT-32	NT Driver, DLL, Extensive Tools	.LIB, .H, Sample source, API Manual
TWAIN-32	DLL	N / A
SCSI-98	(None needed)	Protocol Specification, Test program source

Host Computer Requirements

Disk space will be required to save digitized images. Most images will require 2.5 to 10.5 Mbytes each, depending on the resolution at which the media are digitized. For typical media (with a 5:4 length:width aspect ratio), the maximum disk file sizes at maximum resolution are:

LSDT MODEL	Maximum Disk File Size
LUMISCAN 20	11 Mbytes
LUMISCAN 50	4 Mbytes
LUMISCAN 75	42 Mbytes
LUMISCAN 85	66 Mbytes
ACR-2000	66 Mbytes

For media that are much longer than they are wide, disk file sizes are practically unlimited.
Information regarding a sample application is available in **APPENDIX C** of any **LUMISCAN** or **ACR-2000** Operator's Reference Guide and in the **LSDT** API Dynamic Link Library and **LSDT** Software Library Reference Guides.

6 LUMISYS LSDT INTERFACES

DCB Interface

The **LSDT** DCB interface includes a Data Control Board (DCB) that is installed into an ISA slot on your host computer (PC). It also includes the corresponding host run-time and/or development software.
To install the **LSDT** DCB host run-time and/or development software, you are required to have one of the following Operating Systems installed on your PC and at least 3.0 Mbytes of hard disk space available for the creation of a directory and transfer of files from the distribution disk. Note that in this document, all the 16-bit operating systems are called "DOS" since they all use the exact same Lumisys DOS device driver.
These Host Support Packages are available from Lumisys to use with the DCB interface:

- LSDT-16 Run-time and development support for 16-bit applications
- LSDT-32 Run-time and development support for 32-bit applications
- TWAIN-32 Industry-standard run-time support for 32-bit applications

The LSDT-16 HSP will support the DCB interface on DOS, Windows 3.x, Windows 95 and Windows 98 at the API level.
The LSDT-32 HSP will support the DCB interface on Windows NT at the API level.
The TWAIN-32 HSP will also support the DCB interface on Windows NT. It requires the LSDT-32 HSP.

6.1.1 DCB switches

The DCB card has various jumpers and switches that must be properly configured before it is installed into the host PC. Additionally, the host software driver must be "told" how those jumpers and switches are set.
With no switches, the driver will expect the DCB to be configured for the factory default:

- IRQ 5
- I/O Address 0x100
- Memory Segment Address 0xD000

If one or more of these conflict with other equipment in your particular PC, try these values next:

- IRQ 7
- I/O Address 0x120
- Memory Segment Address 0xD800

Deciding how to configure the DCB sometimes requires a bit of investigative work and is empirically determined. The process you should follow is fully described in the README.TXT file on the HSP floppy distribution disk and will be different for different Operating Systems. The DCB settings themselves are described in "**LSDT** DCB Jumper and Switch Settings", below.

6.1.2 Correction LUT File

Both the DOS and the Windows NT **LSDT** drivers automatically load a Correction LUT (CLUT) file during the driver loading process. When shipped from the factory, this file is named CLTxxxxx.DAT where 'xxxxx' is the serial number of the digitizer on which the CLUT file was created. (Older versions of **LSDT** digitizers shipped with CLUT filenames of the form CLUTxxxx.DAT). The CLUT file is shipped on the distribution floppy disk. This file is used to calibrate the associated digitizer and should be used with that digitizer and that digitizer only.
For DOS, this file must be in the root directory (C:\) and it must be the **ONLY** CLUT file there. For Windows NT, the file must be in a specific directory (%SystemRoot%\SYSTEM32\DRIVERS) and its name must be specified in the LSDT section of the Windows Registry. Since the name is specified, multiple CLUT files may be stored in the same directory. See detailed installation instructions in the following DOS and Windows NT sections.

PRECAUTION
If the DOS or Windows NT **LSDT** driver does not find the CLUT file, a warning will be given (see below) and the driver will default to a 1:1 Correction LUT (i.e., no correction will be applied). What this means is that although the digitizer will function and generate an image, its quality will be affected.

6.1.3 Calibration LUT File (ACR-2000 Only)

Both the DOS and the Windows NT **LSDT** drivers automatically load a Calibration LUT file (Cal LUT) during the driver loading process. When shipped from the factory, this file is named CALxxxxx.DAT, where 'xxxxx' is the serial number of the reader on which the Cal LUT file was created. The Cal LUT file is used to calibrate the X-axis of the associated reader and should be used with that reader and that reader only.
For DOS, this file must be in the root directory (C:\) and it must be the **ONLY** Cal LUT file there. For Windows NT, the file must be in a specific directory (%SystemRoot%\SYSTEM32\DRIVERS) and its name must be specified in the LSDT section of the Windows Registry. Since the name is specified, multiple Cal LUT files may be stored in the same directory. See detailed installation instructions in the following DOS and Windows NT sections.

PRECAUTION – (ACR-2000 Only)
If the DOS or NT driver does not find the Cal LUT file, a warning will be given (see below) and the driver will default to a 1:1 Calibration LUT (i.e., no correction will be applied). What this means is that although the reader will function and generate an image, its quality will be affected.

SCSI Interface

LSDT digitizers may be configured with the Internal SCSI Option (ISO). This option consists primarily of a single-board computer, residing inside the digitizer, that controls the digitizer hardware and interfaces to the host computer via a SCSI port. This interface requires that a SCSI adapter be installed in your host computer or workstation. The **LSDT** digitizer will then communicate with the host via a SCSI cable, using the Lumisys SCSI-98 protocol.
These Host Support Packages are available from Lumisys to use with the SCSI-98 interface:

- LSDT-32 Run-time and development support for 32-bit applications
- TWAIN-32 Industry-standard run-time support for 32-bit applications
- SCSI-98 Development support for all applications using **LSDT** digitizers with ISO.

The LSDT-32 HSP will support SCSI-98 on Windows 95, Windows 98 and Windows NT at the API level.
The TWAIN-32 HSP will also support SCSI-98 on Windows 95, Windows 98 and Windows NT. It requires the LSDT-32 HSP.
The SCSI-98 HSP will support SCSI-98 and is available for several Operating Systems on various PCs and workstations.

6.1.4 Correction LUT File

A Correction LUT (CLUT) file is factory loaded on the ISO card in the digitizer itself. It will be automatically loaded (and applied) by the ISO driver whenever the digitizer is powered on.

6.1.5 SCSI ID Configuration

The only thing that needs to be done is to configure your **LSDT** digitizer's SCSI ID. The first step is to find an unused SCSI ID. How to do this varies with your computer system, but the result will be an ID in the range of 0 to 7. The next step is to decide if the digitizer should terminate the SCSI bus or not. Generally you will want terminated, since the digitizer is at the end of the cable and has no "daisy chain" capability.
Now configure the digitizer to the SCSI ID and termination you have chosen. This is accomplished by setting the small (1/4") rotary switch on the back of the digitizer next to where the SCSI cable plugs in. This dial has 16 settings, marked 0 to F. If you want SCSI ID 0 to 7 *unterminated*, set the dial in the range 0 to 7. If you want SCSI ID 0 to 7 *terminated*, then set the dial in the range 8 to F, where 8 corresponds to SCSI ID 0 and F corresponds to SCSI ID 7.

SWITCH Position	SCSI ID	SCSI Termination
0	**0**	Unterminated
1	**1**	Unterminated
2	**2**	Unterminated
3	**3**	Unterminated
4	**4**	Unterminated
5	**5**	Unterminated
6	**6**	Unterminated
7	**7**	Unterminated

SWITCH Position	SCSI ID	SCSI Termination
8	**0**	Terminated
9	**1**	Terminated
A	**2**	Terminated
B	**3**	Terminated
C	**4**	Terminated
D	**5**	Terminated
E	**6**	Terminated
F	**7**	Terminated

The **LSDT** digitizer is now ready to accept SCSI commands using either:

- the older Lumisys SCSI Compatibility Protocol, or
- the newer Lumisys SCSI-98 Protocol

7 LUMISYS HOST SUPPORT PACKAGES

LSDT-16 for DOS, Windows 3.x, Windows 95, and Windows 98

This is "LSDT-16 Version x.xx for DOS / Windows 95". It only supports the DCB interface. Both the run-time and development support will be installed.

7.1.1 Installation

To install the software, place the floppy distribution disk in drive A. From an MS-DOS command prompt, type ***"a:install"*** and then follow the instructions. The installation software will create a directory on the hard disk and transfer the required software from the floppy disk to the hard disk.
The installation program will copy the CLUT file (CLTxxxxx.DAT) and Cal LUT file (CALxxxxx.DAT) from the floppy distribution disk into the root directory, C:\. Be sure to remove any and all other CLUT and Cal LUT files from the root. They can be stored elsewhere, just not in the root.

NOTE
If, when the DOS driver loads, no CLUT file is found or multiple CLUT files are found in the root, the driver will default to a 1:1 Correction LUT and it will audibly beep.

NOTE – (ACR-2000 Only)
If, when the DOS driver loads, no Cal LUT file is found or multiple Cal LUT files are found in the root, the driver will not use a Calibration LUT and it will audibly beep.

The device driver **LSDTVxxx.COM** (where xxx is the version number) must be loaded by the user for the software to work (see next section). Additionally, if you have changed the DCB settings from their factory default, you must "tell" the driver what you have changed the settings to (see next section).
The driver occupies approximately 17,500 decimal bytes of memory.
For more information, refer to the README.TXT file on the software distribution disk.

7.1.2 Configuration

The **LSDT** DOS driver for the **LSDT** digitizers is on the distribution disk and has the name LSDTVxxx.COM (where xxx is the version number of the driver). The distribution disk also includes a CLTxxxxx.DAT file that, during installation, will be copied to the hard disk root (C:\). The **LSDT** DOS driver, when it loads, will read this file and write it to the hardware. For **ACR-2000** readers, there will also be a CALxxxxx.DAT file.
To load the driver the user should add the command ***"C:\LSDT\TOOLS\LSDTVxxx"*** to the **AUTOEXEC.BAT** file or from the MS-DOS command line type ***"LSDTVxxx"*** (where xxx is the version number of the driver). Note that in all versions of Windows, if you manually load the driver from a DOS command line window, it will only work for programs run from that DOS session, not from programs run from a desktop icon. Also, it may be convenient to add "C:\LSDT\TOOLS" to your PATH statement.
With no switches, the driver will expect the DCB to be configured for:

- IRQ 5
- I/O Address 0x100
- Memory Segment Address 0xD000

If the jumper or switch settings on the DCB are set for **ANY** other values, then the following command line switches **MUST** be used to load the DOS driver with those values:

```
/Ix     Set IRQ to x, where x = 3 through 7

/Mxxxx  Set hardware Memory Segment Address, where xxxx = 0xA000h through
        0xE800h

/Bxxx   Set DCB I/O Base Address, where xxx = 0x100h, 0x120h, 0x140h or 0x160h
```

An example of a driver loaded with these switches:

C:\LSDT\TOOLS\LSDTV360 /I7 /MD800 /B120

To get a complete and up-to-date listing of all driver switches, enter:

C:\LSDT\TOOLS\LSDTV360 /?

Generally you will NOT want to use **any** switches other than the ones listed above, unless directed to do so by a service technician or Lumisys personnel.

LSDT-32 for Windows 95, Windows 98 and Windows NT

This is "LSDT-32 Version x.xx for Windows 95 / Windows NT". On Windows 95 and Windows 98, it only supports the SCSI interface. On Windows NT, it supports both the DCB and SCSI interfaces.

7.1.3 Installation

To install the software, place the floppy distribution disk in drive A. Run SETUP.EXE and follow the instructions. It will create a directory on the hard disk and transfer the required software from the floppy disk to the hard disk. It will also create a "Lumisys" program group and create or update various parameters in the LSDT section of the Windows Registry. When it asks you if you are updating a previous installation, be sure to answer "Yes" (if you are) so it will not overwrite your LSDT parameter values in the Windows Registry, especially the DCB settings for IRQ, I/O Base Address, and Image Memory Segment.

Installation types are:

"Compact"	Run-time support (installs DRIVER, DLL, TOOLS and example program only)
"Typical"	same as "Compact" (for now)
"Custom"	Development support (includes run-time support)

NOTE

Read the README.TXT file included on the distribution disk.
The installation process OVERWRITES previous LSDT parameters values in the Windows Registry if you do not tell it that it is updating a previous installation (see above).
The "%SystemRoot%" directory below represents the directory where Windows was installed (e.g. C:\WINNT or C:\WINDOWS).

7.1.4 DCB Interface on Windows NT

The installation program will copy the CLUT file (CLTxxxxx.DAT) and Cal LUT (CALxxxxx.DAT) file from the floppy distribution disk into the directory, "%SystemRoot%\SYSTEM32\DRIVERS". Use the "LSDT Control Panel" (see below) to enter these filenames into the LSDT section of the Windows Registry.

NOTE

If the specified CLUT file is not found when the Windows NT driver loads, the driver will default to a 1:1 Correction LUT and a warning message will be logged to the Windows NT Event Logger.

NOTE – (ACR-2000 Only)

If, when the Windows NT driver loads, no Cal LUT file is found, the driver will not use a Calibration LUT and a warning message will be logged to the Windows NT Event Logger.

For more information, refer to the README.TXT file on the software distribution disk.

7.1.5 LSDT Registry Parameters

The LSDT Registry Parameters hold configuration data. A tool called LSDTNTCP.EXE ("LSDT for Windows NT Control Panel") allows you to make all common adjustments to the LSDT parameters in the Windows Registry. Direct modification of the registry using the Registry Editor is **NOT** recommended; simple accidents in the registry editor can be disastrous.

To use the Control Panel, select “LSDT Control Panel” from the “Lumisys” program group, or execute LSDTNTCP.EXE in the C:\LSDT32\BIN directory. You may find it convenient to make a desktop icon for this program. The control panel permits selection of various parameters for operation, error logging and diagnostics. For use with the DCB interface, the control panel also permits selection of IRQ Level, I/O Base Address, Memory Segment Address. On Windows NT, you can switch between DCB and SCSI interfaces.

NOTE
System Administrator privileges are required to make changes (write) to the Windows Registry.

TWAIN-32

This is a 32-bit industry-standard driver. It is available to run on Windows 95, Windows 98, and Windows NT for use with the SCSI interface. On Windows NT, it may also be used with the DCB interface. In all cases, it requires the LSDT-32 HSP.

SCSI-98

This is development-only support for the **LSDT** Internal SCSI Option (ISO). This HSP is available for several Operating Systems on various PCs and workstations.
No run-time support is required to operate a digitizer with a SCSI-98 interface, but **ONLY** if the application program is designed to work at the SCSI-98 protocol level. If it is designed to work at the API level, then the LSDT-32 HSP **MUST** be used.
The development support provided describes the SCSI-98 protocol used by Lumisys for the Internal SCSI Option and includes a test program and a simple application program.
SCSI-98 also supports the older “SCSI Compatibility Protocol” previously used by Lumisys **LSDT** digitizers.

8 LSDT DCB JUMPER AND SWITCH SETTINGS

Altering the DCB Settings

If the host PC is running, shut it down and turn off the power. Remove the cover from the host PC. Taking appropriate anti-static precautions, remove the DCB from the accessory box it was shipped in or from the PC, if already installed.
The DCB is factory configured to use IRQ 5, I/O Addresses 100-11F, and a 32-Kbyte Memory Address window at hex address D0000-D7FFF. If the IRQ, I/O Base Address, or 32-Kbyte Memory Address conflict with your system configuration they may be changed according to the following sections.
Install the DCB in an 8- or 16-bit ISA slot. Secure the DCB in the slot and replace the cover.

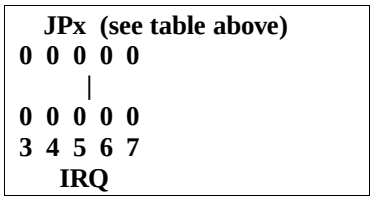
8.1.1 Identifying your Data Control Board (DCB)

There are three versions of the DCB in existence. The newer DCB3 has slightly different switch settings than the DCB1 or DCB2. Here's how to identify them:

Ver	Size		IRQ	Address DIP Switch	Memory Address	Base I/O Address	Memory Size
DCB1	Big	(13" long)	JP1	S1 (6 bits)	S1-1 thru S1-5	S1-6	N / A
DCB2	Med	(9" long)	JP2	S1 (6 bits)	S1-1 thru S1-5	S1-6	N / A
DCB3	Small	(6" long)	JP2	S1 (8 bits)	S1-1 thru S1-5	S1-6 thru S1-7	S1-8

8.1.2 Changing IRQ Level

The **LSDT** digitizer is factory configured to use IRQ level 5. The IRQ level may be changed by setting a jumper on the DCB (JP1 or JP2, see table above). To change the setting, remove the jumper from its current position and move it to the desired level.



If the IRQ is changed from its default setting of ***5***, you must "tell" the driver. For example, to change to IRQ 7:

DOS	Add the **/Ixx** switch to the driver load command: ***C:\LSDT\TOOLS\LSDTVxxx /I7***
Windows NT	Using the LSDT Control Panel, select 7 for "IRQ Number".

8.1.3 Changing Memory Address

The **LSDT** digitizer is factory configured to use a 32-Kbyte Memory Address window starting at hex address D0000 and ending at D7FFF. The upper 5 bits of the address are set with the 6-position ADDRESS SELECT SWITCH (S1-1 through S1-5) on the DCB. The following table shows how to set this switch to achieve the desired address.
NOTE: A 4-digit, 16-bit Memory Segment Address (e.g., 0xD800) corresponds to a 5-digit, 20-bit complete Memory Address (e.g., 0xD8000).

ADDRESS	S1-1	S1-2	S1-3	S1-4	S1-5	COMMENTS
A0000	ON	ON	OFF	OFF	OFF	Normally used for VGA cards
A8000	OFF	ON	OFF	ON	OFF	Normally used for VGA cards
B0000	ON	OFF	OFF	ON	OFF	Normally used for VGA cards
B8000	OFF	OFF	OFF	ON	OFF	Normally used for VGA cards
C0000	ON	ON	ON	OFF	OFF	Normally used for VGA cards
C8000	OFF	ON	ON	OFF	OFF	
D0000	ON	OFF	ON	OFF	OFF	Default Setting for DCB
D8000	OFF	OFF	ON	OFF	OFF	
E0000	ON	ON	OFF	OFF	OFF	
E8000	**OFF**	**ON**	**OFF**	**OFF**	**OFF**	

NOTE: If the address is changed, care must be taken to select an address range that is not being used by another device. The most significant bit of the address is controlled by switch position S1-5.

NOTE: For DOS only, Lumisys supplies a utility program, **FINDMEM**, which can be used to identify potential available address locations in the range A0000-EFFFF. For example:

```
C:\LSDT\TOOLS>FINDMEM
A000:0000   -USED-  A000:0000 = 20
A800:0000   -USED-  A800:0000 = 20
B000:0000   -USED-  B000:0000 = 4D
B800:0000   -USED-  B800:0000 = 20
C000:0000   -USED-  C000:0000 = 55
C800:0000   -USED-  C800:0000 = 4D
D000:0000   **FREE**
D800:0000   -USED-  D800:0000 = 5A
E000:0000   -USED-  E000:0000 = B4
E800:0000   -USED-  E800:0000 = 41
```

NOTE: If the DCB is changed from its default address of ***D0000***, you must 'tell' the driver. For example, to change to a Memory Segment Address at D800:

DOS	Add the **/Mxxxx** switch to the driver load command: ***C:\LSDT\TOOLS\LSDTVxxx /MD800***
Windows NT	Using the LSDT Control Panel, select 0xd8000 for "Image Memory Segment".

EMM386.EXE and your CONFIG.SYS (DOS Only)

If you have a CONFIG.SYS file and if it loads EMM386, then whichever DCB memory address is used, your CONFIG.SYS should be modified to exclude the DCB Memory Mapped Address range from use by EMM386.EXE. The following line is typical:

DEVICE=C:\DOS\EMM386.EXE NOEMS X=D000-D7FF

8.1.4 Changing Base I/O Address

The **LSDT** digitizer is factory configured to use a Base I/O Address of 100. Switch S1-6 is used to set this address**.** Either S1-6 or both S1-6 and S1-7 are used, according to the DCB model.

Placing the switch (or switches) in the factory default OFF position selects the factory default Base I/O Address value of 100. Setting the switch (or switches) to the ON position selects I/O Addresses 120, 140 or 160, according to the DCB model.

How to set this switch to achieve the desired base address for a DCB1 or DCB2:

BASE I/O ADDRESS	S1-6
100	OFF
120	ON

How to set this switch to achieve the desired base address for a DCB3:

BASE I/O ADDRESS	S1-6	S1-7
100	OFF	OFF
120	ON	OFF
140	OFF	ON
160	ON	ON

NOTE: If the DCB is changed from its default base address of ***100***, you must "tell" the driver. For example, to change to a Base I/O Address at 120:

DOS	Add the **/Bxxx** switch to the driver load command: ***C:\LSDT\TOOLS\LSDTVxxx /B120***
Windows NT	Using the LSDT Control Panel, select 0x120 for "I/O Base Address".

8.1.5 Changing Memory Size

For DCB3s only, switch S1-8 is used to specify the size of the memory installed on the DCB:

MEMORY SIZE	S1-8
4 Mbytes	OFF
16 Mbytes	ON

Appendix A: LUMISYS IMAGE HEADER FORMAT

Byte Offset	Type	Description	Nr Bytes	Max Bytes	Example	Notes
0 – 803	N/A	Internal Use	804			* DO NOT USE! *
804 – 805	Integer	**Number of Images**	2		1	
806 – 807	Integer	**Pixels per Line**	2		2048	
808 – 809	Integer	**Lines per Image**	2		2486	
810 – 811	Integer	**Bits per Pixel**	2		12	
812 – 813	Integer	**Window**	2		4095	0 or 65535 imply not used
814 – 815	Integer	**Level**	2		2048	0 or 65535 imply not used
816 – 830	String	**Filename**	15	14	“LSDT.IMG”	
831 – 844	String	**Date**	14	13	“08/12/99”	
845 – 848	Long	**Time**	4		875029872	DOS Time Format (Seconds since 01/01/1970)
849 – 878	String	**Image Source**	30	29	“img_device"	Where image came from. Could be person, company, etc.
879 – 958	String	**Comment**	80	79	“Filtered & enhanced”	
959 – 989	String	**System Description**	31	30	“LS75”	
990 – 999	String	Header ID	10	N/A	“Lumisys”	Header format authentication (Exactly as shown!)
1000 – 1007	String	Version ID	8	N/A	“Hdr_Ver”	Version authentication (Exactly as shown!)
1008 – 1009	Integer	Version Number	2		4	Signifies version 4
1010 – 1011	Integer	**Byte Order**	2		0	0 = LSB, 1 = MSB, 2 = ?SB
1012 – 2047	N/A	Internal Use	1036			* DO NOT USE! *

These values are accessible in the include files LS_HDR.H and LS_HDROB.H. The latter is more object oriented and can be used with LS_HDROB.C. Support for images is supplied in LS_IMG.H and LS_IMG.C.

All header data is stored LSB first; the “Byte Order” field only pertains to the image data which follows.

“Max Bytes” means how many bytes you can put into this string field, not counting the terminating null. Be sure to terminate all strings with a 0.

In general, for pre-existing headers, you should only change the bold-faced items above (“Number of Images” to “System Description”).

If “Hdr_Ver” is not found at 1000, then the Version Number at 1008 is undefined.

If creating a header from scratch, the Header ID, Version ID and Version Number are required, in addition to reasonable values of all the bold-faced items.

Version 3 Added Version ID and Version Number
Version 4 Added Byte Order